

Claims:

1. A method of stimulating an immune response to an antigen in an individual by a heterologous prime-boost immunisation protocol, the method comprising the steps of:

i) administering to the individual a priming composition encoding or containing said antigen to prime said immune response;

ii) administering to the individual a boosting composition encoding or containing said antigen to boost the primed immune response,

wherein one of said priming or boosting compositions comprises lentivirus engineered to comprise nucleic acid encoding said antigen, or an antigen presenting cell transduced in vitro with a lentiviral vector engineered to comprise nucleic acid encoding said antigen.

2. A method according to claim 1 wherein the other of said priming or boosting compositions comprises one or more of:

i) a nucleic acid encoding said antigen;

ii) one or a plurality of peptides, each peptide comprising an epitope, wherein one of said epitopes is said antigen;

iii) a viral vector comprising nucleic acid encoding said antigen;

iv) antigen presenting cells transduced in vitro to express said antigen;

v) a vector, preferably a viral vector, having nucleic acid encoding a plurality of peptides, each peptide comprising an epitope wherein one of said epitopes is said antigen.

3. A method according to claim 2 wherein the nucleic acid of i) is a plasmid or other expression vector.

4. A method according to claim 2 wherein the viral vector of iii) is a pox virus having a modified genome encoding said antigen.

5. A method according to claim 4 wherein the pox virus is a vaccinia virus.

5 6. A method according to claim 2 wherein the viral vector of (iii) is a lentiviral vector engineered to comprise nucleic acid encoding said antigen and wherein the envelope of the lentivirus of one of the boosting or priming compositions is immunogenically different to the other.

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7. A method according to claim 2 wherein the antigen presenting cells of iv) are dendritic cells transduced in vitro by a lentivirus engineered to comprise nucleic acid encoding said antigen.

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8. A method according to claim 1 wherein the priming composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen, and the boosting composition comprises a pox virus having a modified genome encoding said antigen.

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9. A method according to claim 1 wherein the priming composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen, and the boosting composition comprises an immunologically different lentiviral vector engineered to comprise nucleic acid encoding said antigen.

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10. A method according to claim 1 wherein the priming composition comprises a nucleic acid encoding said antigen, and the boosting composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen.

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11. A method according to claim 1 wherein the priming composition comprises a pox virus having a modified genome encoding said antigen, and the boosting composition comprises

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a lentiviral vector engineered to comprise nucleic acid encoding said antigen.

12. A method according to claim 1 wherein the priming composition comprises antigen presenting cells transduced in vitro with a lentiviral vector engineered to comprise nucleic acid encoding said antigen, such that the cells express said antigen, and the boosting composition comprises a pox virus having a modified genome encoding said antigen.

13. A method of boosting a pre-existing immune response to an antigen in an individual, the method comprising the step of administering to the individual lentivirus particles engineered to comprise nucleic acid encoding said antigen, said individual having been previously exposed to said antigen but not having previously been exposed to said lentivirus particles.

14. A method according to claim 13 wherein the individual has previously been exposed to said antigen by administration of nucleic acid encoding the antigen.

15. A method according to claim 14 wherein the nucleic acid is a plasmid or other expression vector.

16. A method according to claim 13 wherein the individual has previously been exposed to the antigen by administration of a pox virus having a genome modified to encode the antigen.

17. A method according to claim 13 wherein the individual has previously been exposed to said antigen by administration of a lentivirus engineered to comprise nucleic acid encoding said antigen, wherein the envelopes of the two lentiviruses are immunologically different to one another.

18. A method according to claim 13 wherein the individual has previously been exposed to the antigen by infection with a pathogen or development of a cancer.

5 19. A kit for stimulation of an immune response against an antigen by a heterologous prime-boost immunisation protocol, the kit comprising (i) a first pharmaceutical composition, encoding or containing said antigen, to prime an immune response against said antigen; and

10 ii) a second pharmaceutical composition, encoding or containing said antigen, to boost the immune response against said antigen;

wherein at least one of said priming or boosting compositions comprises lentivirus engineered to comprise nucleic acid
15 encoding said antigen, or an antigen presenting cell transduced in vitro with a lentiviral vector engineered to comprise nucleic acid encoding said antigen such that the cell expresses the antigen.

20 20. A kit according to claim 19 wherein the other of the priming or boosting compositions comprises one or more of:

i) a nucleic acid encoding said antigen;
ii) one or a plurality of peptides, each peptide comprising an epitope, wherein one of said epitopes is said antigen;

25 iii) a viral vector comprising nucleic acid encoding said antigen;

iv) antigen presenting cells, e.g. DC, transduced in vitro to express said antigen;

30 v) a vector, preferably a viral vector, having nucleic acid encoding a plurality of peptides, each peptide comprising an epitope wherein one of said epitopes is said antigen.

21. A kit according to claim 20 wherein the nucleic acid of
i) is a plasmid or other expression vector.

22. A kit according to claim 20 wherein the viral vector of iii) is a pox virus having a modified genome encoding said antigen.

5 23. A kit according to claim 22 wherein the pox virus is a vaccinia virus.

10 24. A kit according to claim 20 wherein the viral vector of (iii) is a lentiviral vector engineered to comprise nucleic acid encoding said antigen and wherein the envelope of the lentivirus of one of the boosting or priming compositions is immunogenically different to the other.

15 25. A kit according to claim 20 wherein the antigen presenting cells of iv) are dendritic cells transduced in vitro by a lentivirus engineered to comprise nucleic acid encoding said antigen.

20 26. A kit according to claim 20 wherein the priming composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen, and the boosting composition comprises a pox virus having a modified genome encoding said antigen.

25 27. A kit according to claim 20 wherein the priming composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen, and the boosting composition comprises an immunologically different lentiviral vector engineered to comprise nucleic acid encoding said
30 antigen.

35 28. A kit according to claim 20 wherein the priming composition comprises a nucleic acid encoding said antigen, and the boosting composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen.

29. A kit according to claim 20 wherein the priming composition comprises a pox virus having a modified genome encoding said antigen, and the boosting composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen.

30. A kit according to claim 20 wherein the priming composition comprises antigen presenting cells transduced in vitro with a lentiviral vector engineered to comprise nucleic acid encoding said antigen, such that the cells express said antigen, and the boosting composition comprises a pox virus having a modified genome encoding said antigen.

31. Use of a lentivirus engineered to comprise nucleic acid encoding said antigen, or an antigen presenting cell (e.g. a dendritic cell) transduced in vitro with a lentiviral vector engineered to comprise nucleic acid encoding said antigen such that said dendritic cell expresses said antigen, in the preparation of a pharmaceutical composition for the priming or boosting of an immune response against the antigen in a heterologous prime-boost immunisation protocol, wherein the composition is for use in conjunction with a second pharmaceutical composition encoding or containing said antigen, the second pharmaceutical composition being used for the boosting or priming respectively of said immune response.

32. Use according to claim 31 wherein the pharmaceutical composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen, and wherein the composition is for use in priming an immune response in conjunction with a boosting composition comprising a pox virus having a modified genome encoding said antigen.

33. Use according to claim 31 wherein the pharmaceutical composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen, and wherein the

composition is for use in priming an immune response against said antigen in conjunction with a boosting composition comprising an immunologically different lentiviral vector engineered to comprise nucleic acid encoding said antigen.

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33. Use according to claim 30 wherein the pharmaceutical composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen, and is for use in boosting an immune response against said antigen in conjunction with a priming composition comprising an immunologically different lentiviral vector engineered to comprise nucleic acid encoding said antigen.

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34. Use according to claim 30 wherein the pharmaceutical composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen, and is for use in boosting an immune response against said antigen in conjunction with a priming composition comprising a nucleic acid encoding said antigen.

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35. Use according to claim 30 wherein the pharmaceutical composition comprises a lentiviral vector engineered to comprise nucleic acid encoding said antigen, and is for use in boosting an immune response against said antigen, in conjunction with a priming composition comprising a pox virus having a modified genome encoding said antigen.

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36. Use according to claim 30 wherein the pharmaceutical composition comprises antigen presenting cells transduced in vitro with a lentiviral vector engineered to comprise nucleic acid encoding said antigen such that the cells express said antigen; and is for use in priming an immune response against said antigen in conjunction with a boosting composition comprising a pox virus, preferably a vaccinia virus, having a modified genome encoding said antigen.

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